

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 08-213820

(43)Date of publication of application : 20.08.1996

(51)Int.Cl. H01Q 1/32  
H01Q 1/36  
H01Q 5/01

(21)Application number : 07-018214

(71)Applicant : NIPPON SHEET GLASS CO LTD

(22)Date of filing : 06.02.1995

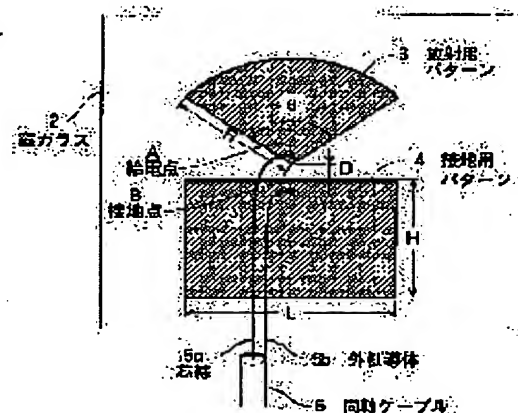
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DOI RYOKICHI

## (54) GLASS ANTENNA SYSTEM FOR MOBILE TELEPHONE SET

### (57)Abstract:

**PURPOSE:** To provide a small sized glass antenna system for mobile telephone set with high sensitivity that receives a radio wave of two UHF bands in an excellent way.

**CONSTITUTION:** A perpendicular from a feeding point A is used for a symmetrical axis, and a projection being upwards having a prescribed angle  $\theta/2$  around the symmetrical axis is formed with two line segments R with a prescribed length extended upward in the vicinity of the feeding point and with a line segment of an optional shape connecting tips of the two line segments. Then a planar radiation pattern 3 and a rectangular grounding pattern 4 having two sides H, L of prescribed lengths are formed symmetrically on a window pane 2 with respect to the symmetrical axis.



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**CLAIMS**

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**[Claim(s)]**

[Claim 1] In the glass antenna equipment for land mobile radiotelephones which used and formed the conductor pattern in the windowpane of an automobile Set a symmetry axis as the perpendicular which passes the feeding point, and it has this symmetry axis and a predetermined include angle. Heights are formed up by the segment of the arbitration configuration which connects between [ of two segments of the predetermined die length prolonged in the upper part near / said / the feeding point, and these two segments ] points. To said symmetry axis The pattern for radiation of the flat-surface configuration of the symmetry, Glass antenna equipment for land mobile radiotelephones characterized by forming on a windowpane the pattern for touch-down of the shape of a rectangle which has two sides of predetermined die length.

[Claim 2] Glass antenna equipment for land mobile radiotelephones according to claim 1 characterized by having formed the segment of said arbitration configuration by the arc which makes the segment of said predetermined die length a radius, and making said pattern for radiation into the shape of a sector.

[Claim 3] Glass antenna equipment for land mobile radiotelephones according to claim 1 characterized by having formed the segment of said arbitration configuration in a straight line, and making said pattern for radiation into the shape of an isosceles triangle.

[Claim 4] Glass antenna equipment for land mobile radiotelephones according to claim 1 characterized by having formed the segment of said arbitration configuration with the polygonal line, and setting said symmetry axis the shape of a polygon of the symmetry as said pattern for radiation.

[Claim 5] Claim 2 characterized by forming said pattern for radiation by the pattern of the outside which extracted inside for the shape of the shape of said sector, and an isosceles triangle, and each multiple configuration by the analog of itself, claim 3, and glass antenna equipment for land mobile radiotelephones according to claim 4.

[Claim 6] Claim 1 characterized by having the impedance adjustment means formed with the conductor pattern the feeding point of said pattern for radiation, and near the grounding point of said pattern for touch-down, claim 2, claim 3, claim 4, and glass antenna equipment for land mobile radiotelephones according to claim 5.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the glass antenna equipment for land mobile radiotelephones which is formed in the windowpane of an automobile, and transmits and receives in a UHF band, and relates to the glass antenna equipment for land mobile radiotelephones from which good sensibility is obtained with one antenna in a frequency band (800MHz and 1.5GHz) especially.

[0002]

[Description of the Prior Art] As these people indicated in the real extraction-of-the-square-root No. 82113 [ five to ] official report, the pattern for radiation consists of monopole configurations, and, as for the conventional glass antenna equipment for land mobile radiotelephones, the pattern for touch-down consists of rectangle-like conductor patterns.

[0003] The block diagram of the conventional glass antenna equipment for land mobile radiotelephones is shown in drawing 9 . In drawing 9 , as for the glass antenna equipment 50 for land mobile radiotelephones, the pattern 52 for radiation and vertical lay length of abbreviation quarter-wave length are formed for vertical lay length with about 1 / four waves on a windowpane 51 by the pattern 53 for touch-down whose die length of a longitudinal direction is about 1 / 4 - 3/4 wave. core wire 54a of a coaxial cable 54 (characteristic impedance of 50ohms) connects at the feeding point A of the pattern 52 for radiation -- having -- the grounding point B of the pattern 53 for touch-down -- the outside of a coaxial cable 54 -- a conductor -- 54b is connected. Thus, as for the glass antenna equipment 50 for land mobile radiotelephones of a monopole configuration, a transceiver frequency is used for the constituted pattern 52 for radiation as an antenna of the land mobile radiotelephone equipment of a 800MHz band.

[0004] Drawing 10 is the directional-characteristics Fig. of the conventional glass antenna equipment for land mobile radiotelephones. In drawing 10 , directional characteristics with a frequency of 900MHz measured in the 800MHz band show an almost uniform value in all the directions, and a sensibility difference is not seen.

[0005]

[Problem(s) to be Solved by the Invention] In addition to a 800MHz band, along with the spread of land mobile radiotelephone equipment, a 1.5GHz band is also increasingly used also for a transceiver frequency, but if the pattern for radiation applies the conventional glass antenna equipment for land mobile radiotelephones of a monopole configuration in a 1.5GHz frequency band, as shown in drawing 10 , on the frequency of 1.5GHz, dispersion will be in directional characteristics and sufficient sensibility will not be obtained.

[0006] In order to acquire good sensibility directional characteristics in a 1.5GHz frequency band, the glass antenna equipment for land mobile radiotelephones of the monopole configuration for 1.5GHz bands is independently needed. When it is going to transmit or receive the electric wave of a frequency band (800MHz and 1.5GHz) good, 2 sets, the number of the coaxial cables which connect the number of glass antennas to a transmitter-receiver, and the same number, are needed. Thus, when it is going to form the with a monopole configuration [ for frequency bands ] (800MHz and 1.5GHz) glass antenna equipment for land mobile radiotelephones on the windowpane of an automobile, the technical problem to which a large mounting tooth space is required, and the miniaturization of an antenna cannot be attained, and manufacture becomes complicated occurs. Therefore, glass antenna equipment for land mobile radiotelephones which has sensibility directional characteristics even with a good frequency band (800MHz and 1.5GHz) is desired.

[0007] It was made in order that this invention might solve such a technical problem, and that purpose is in

offering the glass antenna equipment for land mobile radiotelephones which can receive the electric wave of two frequency bands, 800MHz and 1.5GHz, good.

[0008]

[Means for Solving the Problem] The glass antenna equipment for land mobile radiotelephones applied to this invention in order to solve said technical problem Set a symmetry axis as the perpendicular which passes the feeding point, and it has this symmetry axis and a predetermined include angle. Heights are formed up by the segment of the arbitration configuration which connects between [ of two segments of the predetermined die length prolonged in the upper part near the feeding point, and these two segments ] points. To a symmetry axis The pattern for radiation of the flat-surface configuration of the symmetry, [0009] characterized by forming on a windowpane the pattern for touch-down of the shape of a rectangle which has two sides of predetermined die length Moreover, the glass antenna equipment for land mobile radiotelephones concerning this invention forms the segment of an arbitration configuration by the arc which makes the segment of predetermined die length a radius, and is characterized by making the pattern for radiation into the shape of a sector.

[0010] Moreover, the glass antenna equipment for land mobile radiotelephones concerning this invention forms the segment of an arbitration configuration in a straight line, and is characterized by making the pattern for radiation into the shape of an isosceles triangle.

[0011] Furthermore, the glass antenna equipment for land mobile radiotelephones concerning this invention forms the segment of an arbitration configuration with the polygonal line, and is characterized by setting a symmetry axis the shape of a polygon of the symmetry as the pattern for radiation.

[0012] Moreover, the glass antenna equipment for land mobile radiotelephones concerning this invention is the pattern of the outside which extracted inside for the shape of the shape of a sector, and an isosceles triangle, and each multiple configuration by the analog of itself, and is characterized by forming the pattern for radiation.

[0013] Furthermore, the glass antenna equipment for land mobile radiotelephones concerning this invention is characterized by having the impedance adjustment means formed with the conductor pattern near the feeding point of the pattern for radiation, and the grounding point of the pattern for touch-down.

[0014]

[Function] The glass antenna equipment for land mobile radiotelephones concerning this invention Set a symmetry axis as the perpendicular which passes the feeding point, and it has this symmetry axis and a predetermined include angle. Heights are formed up by the segment of the arbitration configuration which connects between [ of two segments of the predetermined die length prolonged in the upper part near the feeding point, and these two segments ] points. To a symmetry axis The pattern for radiation of the flat-surface configuration of the symmetry, Since the pattern for touch-down of the shape of a rectangle which has two sides of predetermined die length was formed on the windowpane, the electric wave of a frequency band (800MHz and 1.5GHz) is receivable good with one glass antenna equipment for land mobile radiotelephones.

[0015] Moreover, since the glass antenna equipment for land mobile radiotelephones concerning this invention formed the segment of an arbitration configuration by the arc which makes the segment of predetermined die length a radius and made the pattern for radiation the shape of a sector, it is one glass antenna equipment for land mobile radiotelephones, and can receive the electric wave of a frequency band (800MHz and 1.5GHz) good.

[0016] Moreover, since the glass antenna equipment for land mobile radiotelephones concerning this invention formed the segment of an arbitration configuration in a straight line and made the pattern for radiation the shape of an isosceles triangle, it is one glass antenna equipment for land mobile radiotelephones, and can receive the electric wave of a frequency band (800MHz and 1.5GHz) good.

[0017] Furthermore, since the glass antenna equipment for land mobile radiotelephones concerning this invention formed the segment of an arbitration configuration with the polygonal line and set the symmetry axis the shape of a polygon of the symmetry as the pattern for radiation, it is one glass antenna equipment for land mobile radiotelephones, and can receive the electric wave of a frequency band (800MHz and 1.5GHz) good.

[0018] Moreover, the glass antenna equipment for land mobile radiotelephones concerning this invention is the pattern of the outside which extracted inside for the shape of the shape of a sector, and an isosceles triangle, and each multiple configuration by the analog of itself, since it formed the pattern for radiation, is one glass antenna equipment for land mobile radiotelephones, and can receive the electric wave of a frequency band (800MHz and 1.5GHz) good.

[0019] Furthermore, since the glass antenna equipment for land mobile radiotelephones concerning this invention was equipped with the impedance adjustment means formed with the conductor pattern near the feeding point of the pattern for radiation, and the grounding point of the pattern for touch-down, it can perform adjustment of the coaxial cable and impedance which are connected to the feeding point of the pattern for radiation, and the grounding point of the pattern for touch-down, can cover the whole frequency band, and can raise sensibility.

[0020]

[Example] Hereafter, the example of this invention is explained based on an accompanying drawing. Drawing 1 is the block diagram of the glass antenna equipment for land mobile radiotelephones concerning this invention. In drawing 1, the glass antenna equipment 1 for land mobile radiotelephones forms the pattern 3 for radiation of the shape of a sector which has a predetermined radius  $R$  and a predetermined include angle  $\theta$ , and the pattern 4 for touch-down of the shape of a rectangle which has two sides of predetermined die length on a windowpane 2 in distance  $D$ . moreover, the feeding point A of the pattern 3 for radiation -- core wire 5a of a coaxial cable 5 (characteristic impedance of 50ohms) -- connecting -- the grounding point B of the pattern 4 for touch-down -- the outside of a coaxial cable 5 -- a conductor -- 5b is connected.

[0021] With the radius  $R$  of the sector-like pattern 3 for radiation, and the value of an include angle  $\theta$ , the impedance and frequency band of glass antenna equipment are set up. When setting the impedance of a glass antenna as 50 ohms of abbreviation, the next range ( $30\text{ mm} < R < 60\text{ mm}$ ,  $80\text{ degrees} < \theta < 140\text{ degrees}$ ) of the value of  $R$  and  $\theta$  is desirable. Moreover, the next range ( $2\text{ mm} < D < 10\text{ mm}$ ) of the value of the distance  $D$  of the pattern 3 for radiation and the pattern 4 for touch-down is desirable.

[0022] Many properties of explaining below the radius  $R$  of the sector-like pattern 3 for radiation 45mm, Vertical lay length  $H$  of the pattern 4 for touch-down of the shape of 120 degrees and a rectangle for an include angle  $\theta$  40mm, The distance  $D$  of 60mm, the pattern 3 for radiation, and the pattern 4 for touch-down for die-length  $L$  of a longitudinal direction 5mm, The die length of a coaxial cable 5 (characteristic impedance of 50ohms) was set as 2m, and the glass antenna equipment 1 for land mobile radiotelephones installed and measured by whenever [ tilt-angle / of 30 degrees ] on the copper plate arranged horizontally supposing being prepared in windowpane top 2 toward which the front face of an automobile or the tooth back inclined.

[0023] Drawing 2 is the directional-characteristics Fig. of the glass antenna equipment for land mobile radiotelephones concerning this invention. the property at the time of measuring by 900MHz and 1.5GHz in drawing 2 -- it is -- both frequencies -- all \*\*\*\* -- an almost uniform value is shown and good directional characteristics are acquired.

[0024] Drawing 3 is a sensibility frequency-characteristics Fig. in the 800MHz band of the glass antenna equipment for land mobile radiotelephones concerning this invention. In drawing 3, as compared with the conventional glass antenna equipment for land mobile radiotelephones, the glass antenna equipment for land mobile radiotelephones of this invention is level which is convenient practically, although average sensibility is falling slightly in the whole frequency band.

[0025] Drawing 4 is a sensibility frequency-characteristics Fig. in the 1.5GHz band of the glass antenna equipment for land mobile radiotelephones concerning this invention. In drawing 4, the glass antenna equipment for land mobile radiotelephones of this invention is level as compared with the conventional glass antenna equipment for land mobile radiotelephones, cover the whole frequency band, high average sensibility and almost equivalent to the average sensibility of the 800MHz band shown in drawing 3  $R > 3$ .

[0026] Drawing 5 is a voltage standing wave ratio frequency-characteristics Fig. in the 800MHz band of the glass antenna equipment for land mobile radiotelephones concerning this invention. A voltage standing wave ratio shows that adjustment of the impedance of an antenna and a coaxial cable can be taken, so that the value is small. In drawing 5, as compared with the conventional glass antenna equipment for land mobile radiotelephones, the glass antenna equipment for land mobile radiotelephones of this invention covers the whole frequency band, and shows an almost equivalent value.

[0027] Drawing 6 is a voltage standing wave ratio frequency-characteristics Fig. in the 1.5GHz band of the glass antenna equipment for land mobile radiotelephones concerning this invention. In drawing 6, the glass antenna equipment for land mobile radiotelephones of this invention has a small numeric value, and has taken adjustment of the impedance of an antenna and a coaxial cable.

[0028] Drawing 7 is another example block diagram of the glass antenna equipment for land mobile

radiotelephones concerning this invention. In drawing 7, a point equipped with the impedance adjustment means 7 which formed the glass antenna equipment 6 for land mobile radiotelephones with the conductor pattern near the feeding point A of the pattern 3 for radiation and the grounding point B of the pattern 4 for touch-down differs from the glass antenna equipment for land mobile radiotelephones of drawing 1. By having the impedance adjustment means 7, adjustment of an impedance with the coaxial cable 5 connected to the feeding point A of the pattern 3 for radiation and the grounding point B of the pattern 4 for touch-down can be taken, the whole frequency band can be covered, and sensibility can be raised.

[0029] Drawing 8 is another example block diagram at the pan of the glass antenna equipment for land mobile radiotelephones concerning this invention. As shown in drawing 8 (a), the glass antenna equipment 8 for land mobile radiotelephones may consist of isosceles triangle-like a pattern 9 for radiation, and rectangle-like a pattern 4 for touch-down. Moreover, as shown in drawing 8 (b), the glass antenna equipment 10 for land mobile radiotelephones may constitute the pattern 11 for radiation which made the splay extraction, and the rectangle section from a pattern for touch-down made into extraction.

[0030] In addition, the pattern for radiation may make 120 degrees the include angle theta of the pattern 3 for radiation of the shape of a sector shown in drawing 1, and may form it in the shape of a rhombus by one on the arc of the two sides and sector of a radius R.

[0031]

[Effect of the Invention] As explained above, the glass antenna equipment for land mobile radiotelephones concerning this invention Set a symmetry axis as the perpendicular which passes the feeding point, and it has this symmetry axis and a predetermined include angle. Heights are formed up by the segment of the arbitration configuration which connects between [ of two segments of the predetermined die length prolonged in the upper part near the feeding point, and these two segments ] points. To a symmetry axis The pattern for radiation of the flat-surface configuration of the symmetry, The pattern for touch-down of the shape of a rectangle which has two sides of predetermined die length is formed on a windowpane. With one glass antenna equipment for land mobile radiotelephones Since the electric wave of a frequency band (800MHz and 1.5GHz) is receivable good, the mounting space efficiency of an antenna becomes good and a miniaturization can be attained.

[0032] Moreover, the glass antenna equipment for land mobile radiotelephones concerning this invention forms the segment of an arbitration configuration by the arc which makes the segment of predetermined die length a radius, makes the pattern for radiation the shape of a sector, is one glass antenna equipment for land mobile radiotelephones, and since it can receive the electric wave of a frequency band (800MHz and 1.5GHz) good, the mounting space efficiency of an antenna becomes good and it can attain a miniaturization.

[0033] Moreover, the glass antenna equipment for land mobile radiotelephones concerning this invention forms the segment of an arbitration configuration in a straight line, makes the pattern for radiation the shape of an isosceles triangle, is one glass antenna equipment for land mobile radiotelephones, and since it can receive the electric wave of a frequency band (800MHz and 1.5GHz) good, the mounting space efficiency of an antenna becomes good and it can attain a miniaturization.

[0034] Furthermore, the glass antenna equipment for land mobile radiotelephones concerning this invention forms the segment of an arbitration configuration with the polygonal line, sets a symmetry axis the shape of a polygon of the symmetry as the pattern for radiation, is one glass antenna equipment for land mobile radiotelephones, and since it can receive the electric wave of a frequency band (800MHz and 1.5GHz) good, the mounting space efficiency of an antenna becomes good and it can attain a miniaturization.

[0035] Moreover, it is the pattern of the outside which extracted inside for the shape of the shape of a sector, and an isosceles triangle, and each multiple configuration by the analog of itself, the glass antenna equipment for land mobile radiotelephones concerning this invention forms the pattern for radiation, is one glass antenna equipment for land mobile radiotelephones, and since it can receive the electric wave of a frequency band (800MHz and 1.5GHz) good, the mounting space efficiency of an antenna becomes good and it can attain a miniaturization.

[0036] Moreover, since the glass antenna equipment for land mobile radiotelephones concerning this invention is adjusted with the feeding point of the pattern for radiation, and the coaxial cable which was equipped with the impedance adjustment means formed with the conductor pattern near the grounding point of the pattern for touch-down, and was connected to the feeding point and a grounding point, it can cover the whole frequency band and can realize high sensitivity.

[0037] Therefore, the electric wave of two frequency bands, 800MHz and 1.5GHz, is received good, it is small and the glass antenna equipment for land mobile radiotelephones of high sensitivity can be offered.

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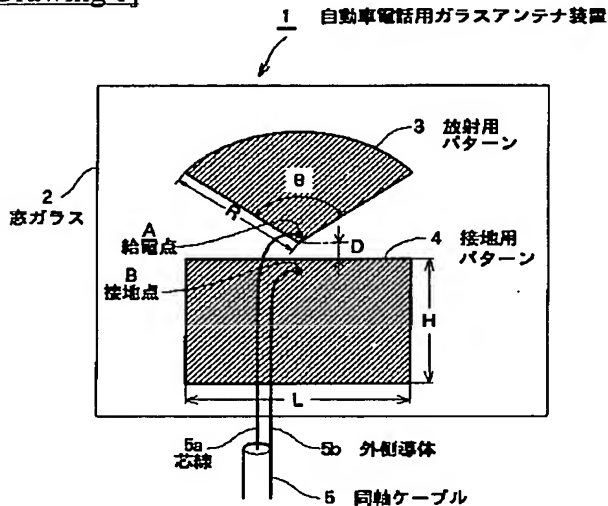
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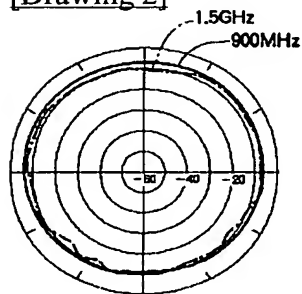
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## DRAWINGS

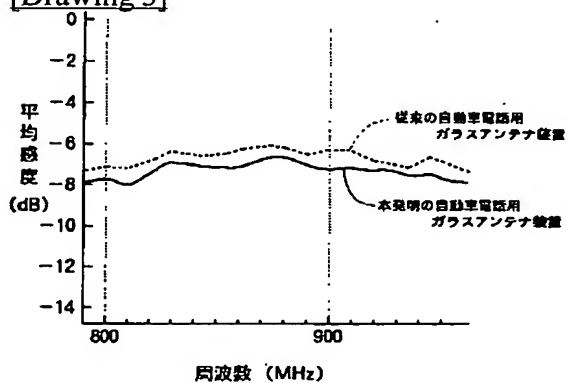
[Drawing 1]



[Drawing 2]

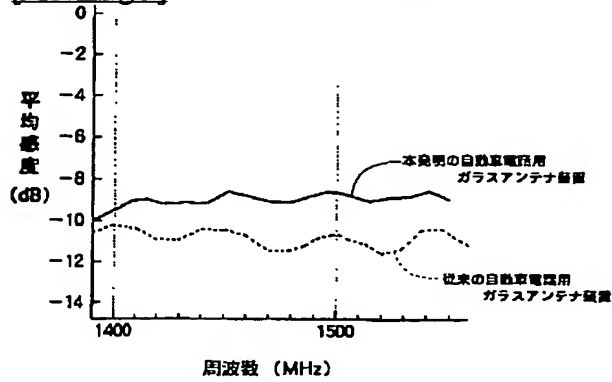


[Drawing 3]

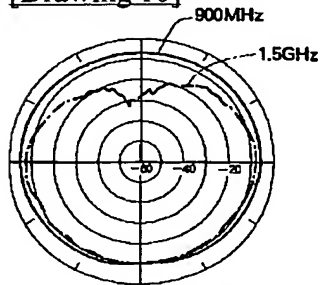




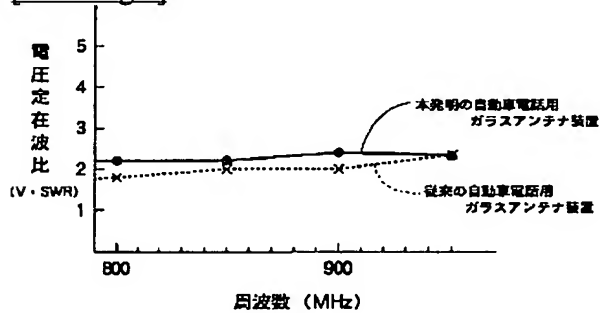
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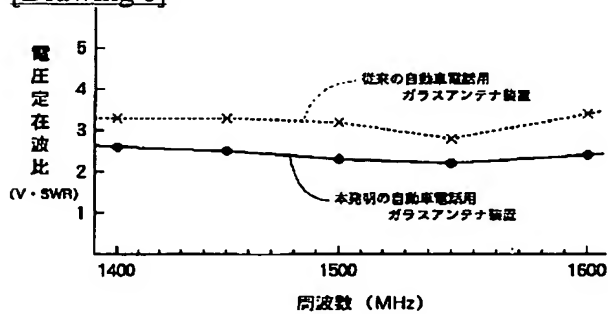
[Drawing 10]



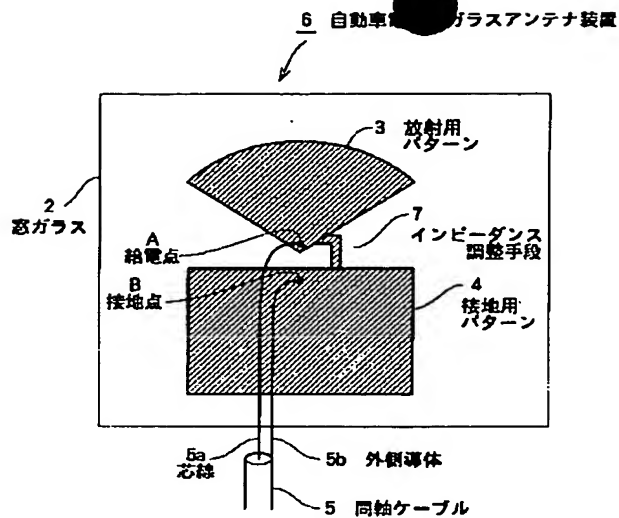
[Drawing 5]



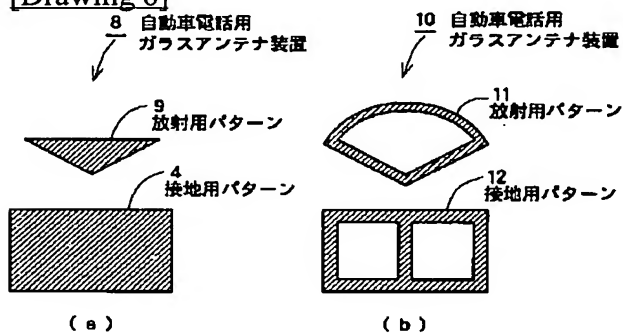
[Drawing 6]



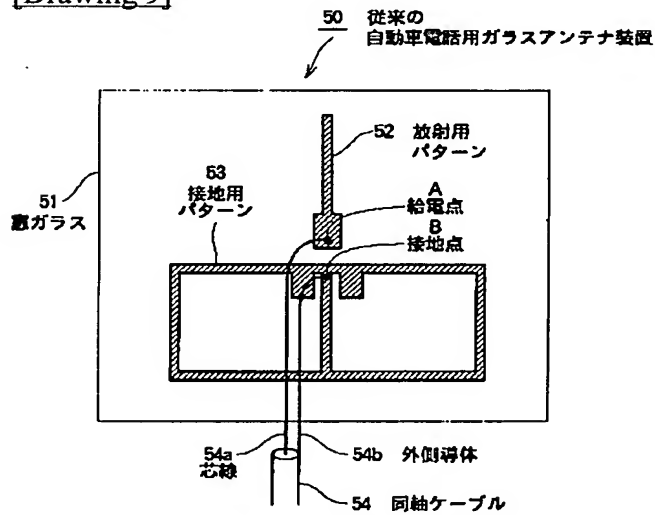
[Drawing 7]



[Drawing 8]



[Drawing 9]



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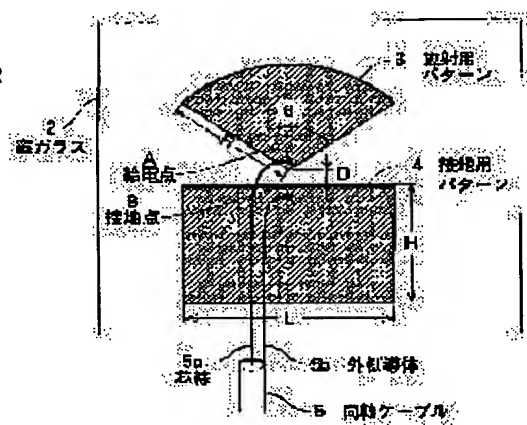
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[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開平8-213820

(43) 公開日 平成8年(1996)8月20日

(51) Int.Cl. <sup>8</sup>	識別記号	庁内整理番号	F I	技術表示箇所
H 0 1 Q	1/32	A		
	1/36			
	5/01			

審査請求 未請求 請求項の数 6 O L (全 6 頁)

(21) 出願番号 特願平7-18214

(22) 出願日 平成7年(1995)2月6日

(71) 出願人 000004008

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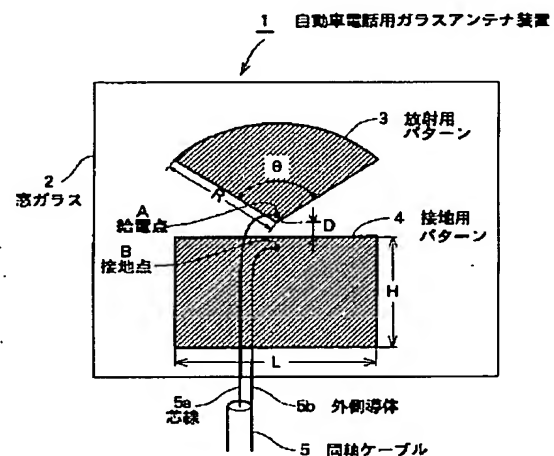
(74) 代理人 弁理士 下田 容一郎 (外2名)

(54) 【発明の名称】 自動車電話用ガラスアンテナ装置

(57) 【要約】

【目的】 800MHzと1.5GHzの2つの周波数帯域の電波を良好に受信する小形で高感度の自動車電話用ガラスアンテナ装置を提供する。

【構成】 給電点Aを通過する垂線を対称軸とし、この対称軸と所定角度 $\theta/2$ を有し、給電点近傍から上方に延びる所定の長さRの2つの線分、この2つの線分の先端部相互間を接続する任意形状の線分とで上方に凸部を形成し、対称軸に対称の平面形状の放射用パターン3と、所定の長さH、Lの2辺を有する矩形形状の接地用パターン4とを窓ガラス2上に形成した自動車電話用ガラスアンテナ装置1。



## 【特許請求の範囲】

【請求項 1】 自動車の窓ガラスに導体パターンを用いて形成した自動車電話用ガラスアンテナ装置において、給電点を通過する垂線を対称軸とし、この対称軸と所定角度を有し、前記給電点近傍から上方に延びる所定の長さの 2 つの線分、この 2 つの線分の先端部相互間を接続する任意形状の線分とで上方に凸部を形成し、前記対称軸に対称の平面形状の放射用パターンと、所定の長さの 2 辺を有する矩形の接地用パターンとを窓ガラス上に形成したことを特徴とする自動車電話用ガラスアンテナ装置。

【請求項 2】 前記任意形状の線分を前記所定の長さの線分を半径とする弧で形成し、前記放射用パターンを扇形状としたことを特徴とする請求項 1 記載の自動車電話用ガラスアンテナ装置。

【請求項 3】 前記任意形状の線分を直線で形成し、前記放射用パターンを二等辺三角形形状としたことを特徴とする請求項 1 記載の自動車電話用ガラスアンテナ装置。

【請求項 4】 前記任意形状の線分を折れ線で形成し、前記放射用パターンを前記対称軸に対称の多角形状としたことを特徴とする請求項 1 記載の自動車電話用ガラスアンテナ装置。

【請求項 5】 前記扇形状、二等辺三角形形状、多角形状それぞれを、それ自身の相似形で中を抜いた外側のパターンで、前記放射用パターンを形成したことを特徴とする請求項 2、請求項 3、および請求項 4 記載の自動車電話用ガラスアンテナ装置。

【請求項 6】 前記放射用パターンの給電点と、前記接地用パターンの接地点近傍に導体パターンで形成したインピーダンス調整手段を備えたことを特徴とする請求項 1、請求項 2、請求項 3、請求項 4、および請求項 5 記載の自動車電話用ガラスアンテナ装置。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】この発明は自動車の窓ガラスに形成されて UHF 帯域で送受信を行なう自動車電話用ガラスアンテナ装置に係り、特に 800MHz と 1.5GHz の周波数帯域において、1 つのアンテナで良好な感度が得られる自動車電話用ガラスアンテナ装置に関する。

## 【0002】

【従来の技術】本出願人が実開平 5-82113 号公報で開示したように、従来の自動車電話用ガラスアンテナ装置は、放射用パターンがモノポール形状で接地用パターンが矩形の導体パターンで構成されている。

【0003】図 9 に従来の自動車電話用ガラスアンテナ装置の構成図を示す。図 9 において、自動車電話用ガラスアンテナ装置 50 は、窓ガラス 51 上に、上下方向の長さが約 1/4 波長の放射用パターン 52 と、上下方向の長さが約 1/4 波長で左右方向の長さが約 1/4 ～ 3/4 波長の接地用パターン 53 とで形成される。放射用

パターン 52 の給電点 A には、同軸ケーブル 54 (特性インピーダンス 50Ω) の芯線 54a が接続され、接地用パターン 53 の接地点 B には、同軸ケーブル 54 の外側導体 54b が接続される。このように構成された放射用パターン 52 がモノポール形状の自動車電話用ガラスアンテナ装置 50 は、送受信周波数が 800MHz 帯域の自動車電話装置のアンテナとして使用される。

【0004】図 10 は従来の自動車電話用ガラスアンテナ装置の指向特性図である。図 10 において、800MHz 帯域において測定した周波数 900MHz での指向特性は全方向でほぼ均一な値を示し、感度差はみられない。

## 【0005】

【発明が解決しようとする課題】自動車電話装置の普及につれて送受信周波数も 800MHz 帯域に加えて 1.5GHz 帯域も利用されるようになってきているが、放射用パターンがモノポール形状の従来の自動車電話用ガラスアンテナ装置を 1.5GHz の周波数帯域で適用すると、図 10 に示すように、1.5GHz の周波数では指向特性にばらつきがあり充分な感度が得られない。

【0006】1.5GHz の周波数帯域で良好な感度指向特性を得るには、1.5GHz 帯域用のモノポール形状の自動車電話用ガラスアンテナ装置が、別に必要になる。800MHz と 1.5GHz の周波数帯域の電波を良好に送信または受信しようすると、ガラスアンテナの数は送受信装置に接続する同軸ケーブルの数と同数の 2 組が必要になる。このように、800MHz と 1.5GHz の周波数帯域用のモノポール形状の自動車電話用ガラスアンテナ装置を自動車の窓ガラス上に形成しようとすると、広い実装スペースが要求され、アンテナの小形化が図れず、かつ製造が複雑になる課題がある。そのため、800MHz と 1.5GHz の周波数帯域でも良好な感度指向特性を有する自動車電話用ガラスアンテナ装置が望まれている。

【0007】この発明はこのような課題を解決するためなされたもので、その目的は 800MHz と 1.5GHz の 2 つの周波数帯域の電波を良好に受信できる自動車電話用ガラスアンテナ装置を提供することにある。

## 【0008】

【課題を解決するための手段】前記課題を解決するためこの発明に係る自動車電話用ガラスアンテナ装置は、給電点を通過する垂線を対称軸とし、この対称軸と所定角度を有し、給電点近傍から上方に延びる所定の長さの 2 つの線分、この 2 つの線分の先端部相互間を接続する任意形状の線分とで上方に凸部を形成し、対称軸に対称の平面形状の放射用パターンと、所定の長さの 2 辺を有する矩形の接地用パターンとを窓ガラス上に形成したことを特徴とする

【0009】また、この発明に係る自動車電話用ガラスアンテナ装置は、任意形状の線分を所定の長さの線分を

半径とする弧で形成し、放射用パターンを扇形状としたことを特徴とする。

【0010】また、この発明に係る自動車電話用ガラスアンテナ装置は、任意形状の線分を直線で形成し、放射用パターンを二等辺三角形形状としたことを特徴とする。

【0011】さらに、この発明に係る自動車電話用ガラスアンテナ装置は、任意形状の線分を折れ線で形成し、放射用パターンを対称軸に対称の多角形状としたことを特徴とする。

【0012】また、この発明に係る自動車電話用ガラスアンテナ装置は、扇形状、二等辺三角形形状、多角形状それぞれを、それ自身の相似形で中を抜いた外側のパターンで、放射用パターンを形成したことを特徴とする。

【0013】さらに、この発明に係る自動車電話用ガラスアンテナ装置は、放射用パターンの給電点と接地用パターンの接地点近傍に導体パターンで形成したインピーダンス調整手段を備えたことを特徴とする。

【0014】

【作用】この発明に係る自動車電話用ガラスアンテナ装置は、給電点を通過する垂線を対称軸とし、この対称軸と所定角度を有し、給電点近傍から上方に延びる所定の長さの2つの線分、この2つの線分の先端部相互間を接続する任意形状の線分とで上方に凸部を形成し、対称軸に対称の平面形状の放射用パターンと、所定の長さの2辺を有する矩形形状の接地用パターンとを窓ガラス上に形成したので、1つの自動車電話用ガラスアンテナ装置で、800MHzと1.5GHzの周波数帯域の電波を良好に受信することができる。

【0015】また、この発明に係る自動車電話用ガラスアンテナ装置は、任意形状の線分を所定の長さの線分を半径とする弧で形成し、放射用パターンを扇形状としたので、1つの自動車電話用ガラスアンテナ装置で、800MHzと1.5GHzの周波数帯域の電波を良好に受信することができる。

【0016】また、この発明に係る自動車電話用ガラスアンテナ装置は、任意形状の線分を直線で形成し、放射用パターンを二等辺三角形形状としたので、1つの自動車電話用ガラスアンテナ装置で、800MHzと1.5GHzの周波数帯域の電波を良好に受信することができる。

【0017】さらに、この発明に係る自動車電話用ガラスアンテナ装置は、任意形状の線分を折れ線で形成し、放射用パターンを対称軸に対称の多角形状としたので、1つの自動車電話用ガラスアンテナ装置で、800MHzと1.5GHzの周波数帯域の電波を良好に受信することができる。

【0018】また、この発明に係る自動車電話用ガラスアンテナ装置は、扇形状、二等辺三角形形状、多角形状それぞれを、それ自身の相似形で中を抜いた外側のパターンで、放射用パターンを形成したので、1つの自動車電

話用ガラスアンテナ装置で、800MHzと1.5GHzの周波数帯域の電波を良好に受信することができる。

【0019】さらに、この発明に係る自動車電話用ガラスアンテナ装置は、放射用パターンの給電点と接地用パターンの接地点近傍に導体パターンで形成したインピーダンス調整手段を備えたので、放射用パターンの給電点と接地用パターンの接地点に接続される同軸ケーブルとインピーダンスの整合ができ、周波数帯域全体に亘り感度を高めることができる。

【0020】

【実施例】以下、この発明の実施例を添付図面に基づいて説明する。図1はこの発明に係る自動車電話用ガラスアンテナ装置の構成図である。図1において、自動車電話用ガラスアンテナ装置1は、所定の半径Rと角度 $\theta$ を有する扇形状の放射用パターン3と、所定の長さの2辺を有する矩形形状の接地用パターン4とを、距離Dで窓ガラス2上に形成する。また、放射用パターン3の給電点Aに、同軸ケーブル5（特性インピーダンス50 $\Omega$ ）の芯線5aを接続し、接地用パターン4の接地点Bに、同軸ケーブル5の外側導体5bを接続する。

【0021】扇形状の放射用パターン3の半径Rと角度 $\theta$ の値により、ガラスアンテナ装置のインピーダンスや周波数帯域を設定する。ガラスアンテナのインピーダンスを略50 $\Omega$ に設定する場合は、Rと $\theta$ の値は次の範囲（30mm<R<60mm、80°< $\theta$ <140°）が望ましい。また、放射用パターン3と接地用パターン4の距離Dの値は次の範囲（2mm<D<10mm）が望ましい。

【0022】以下に説明する諸特性は、扇形状の放射用パターン3の半径Rを45mm、角度 $\theta$ を120°、矩形形状の接地用パターン4の上下方向の長さHを40mm、左右方向の長さLを60mm、放射用パターン3と接地用パターン4の距離Dを5mm、同軸ケーブル5（特性インピーダンス50 $\Omega$ ）の長さを2mに設定し、自動車電話用ガラスアンテナ装置1が自動車の前面または背面の傾斜した窓ガラス2上に設けられることを想定し、水平に配置された銅板上に30°の傾斜角度で設置して測定した。

【0023】図2はこの発明に係る自動車電話用ガラスアンテナ装置の指向特性図である。図2において、900MHzと1.5GHzで測定した場合の特性であり、両周波数で全方向ほぼ均一な値を示し、良好な指向特性が得られる。

【0024】図3はこの発明に係る自動車電話用ガラスアンテナ装置の800MHz帯域における感度周波数特性図である。図3において、本発明の自動車電話用ガラスアンテナ装置は、従来の自動車電話用ガラスアンテナ装置に比較して、周波数帯域全体でわずかに平均感度が低下しているが実用上支障のないレベルである。

【0025】図4はこの発明に係る自動車電話用ガラス

アンテナ装置の1.5GHz帯域における感度周波数特性図である。図4において、本発明の自動車電話用ガラスアンテナ装置は従来の自動車電話用ガラスアンテナ装置に比較して周波数帯域全体に亘り平均感度が高く、図3に示す800MHz帯域の平均感度とほぼ同等なレベルである。

【0026】図5はこの発明に係る自動車電話用ガラスアンテナ装置の800MHz帯における電圧定在波比周波数特性図である。電圧定在波比はその値が小さいほど、アンテナと同軸ケーブルのインピーダンスの整合がとれることを示す。図5において、本発明の自動車電話用ガラスアンテナ装置は従来の自動車電話用ガラスアンテナ装置に比較し、周波数帯域全体に亘りほぼ同等の値を示す。

【0027】図6はこの発明に係る自動車電話用ガラスアンテナ装置の1.5GHz帯における電圧定在波比周波数特性図である。図6において、本発明の自動車電話用ガラスアンテナ装置は、数値が小さく、アンテナと同軸ケーブルとのインピーダンスの整合がとれている。

【0028】図7はこの発明に係る自動車電話用ガラスアンテナ装置の別実施例構成図である。図7において、自動車電話用ガラスアンテナ装置6は放射用パターン3の給電点Aと接地用パターン4の接地点Bの近傍に導体パターンで形成したインピーダンス調整手段7を備える点が、図1の自動車電話用ガラスアンテナ装置と異なる。インピーダンス調整手段7を備えることにより、放射用パターン3の給電点Aと接地用パターン4の接地点Bに接続された同軸ケーブル5とのインピーダンスの整合をとり、周波数帯域全体に亘り感度を高めることができる。

【0029】図8はこの発明に係る自動車電話用ガラスアンテナ装置のさらに別実施例構成図である。図8(a)に示すように、自動車電話用ガラスアンテナ装置8は、二等辺三角形形状の放射用パターン9と矩形形状の接地用パターン4で構成しても良い。また、図8(b)に示すように、自動車電話用ガラスアンテナ装置10は、扇形部を中抜きにした放射用パターン11と矩形部を中抜きにした接地用パターンで構成しても良い。

【0030】なお、放射用パターンは、図1に示す扇形状の放射用パターン3の角度 $\theta$ を $120^\circ$ とし、半径Rの2辺と扇形の弧上の一点とで菱形形状に形成しても良い。

【0031】

【発明の効果】以上説明したように、この発明に係る自動車電話用ガラスアンテナ装置は、給電点を通過する垂線を対称軸とし、この対称軸と所定角度を有し、給電点近傍から上方に延びる所定の長さの2つの線分、この2つの線分の先端部相互間を接続する任意形状の線分とで上方に凸部を形成して対称軸に對称の平面形状の放射用パターンと、所定の長さの2辺を有する矩形形状の接地用

パターンとを窓ガラス上に形成し、1つの自動車電話用ガラスアンテナ装置で、800MHzと1.5GHzの周波数帯域の電波を良好に受信することができるので、アンテナの実装スペース効率が良くなり、小形化を図ることができる。

【0032】また、この発明に係る自動車電話用ガラスアンテナ装置は、任意形状の線分を所定の長さの線分を半径とする弧で形成して放射用パターンを扇形状とし、1つの自動車電話用ガラスアンテナ装置で、800MHzと1.5GHzの周波数帯域の電波を良好に受信することができるので、アンテナの実装スペース効率が良くなり、小形化を図ることができる。

【0033】また、この発明に係る自動車電話用ガラスアンテナ装置は、任意形状の線分を直線で形成して放射用パターンを二等辺三角形形状とし、1つの自動車電話用ガラスアンテナ装置で、800MHzと1.5GHzの周波数帯域の電波を良好に受信することができるので、アンテナの実装スペース効率が良くなり、小形化を図ることができる。

【0034】さらに、この発明に係る自動車電話用ガラスアンテナ装置は、任意形状の線分を折れ線で形成して放射用パターンを対称軸に對称の多角形状とし、1つの自動車電話用ガラスアンテナ装置で、800MHzと1.5GHzの周波数帯域の電波を良好に受信することができるので、アンテナの実装スペース効率が良くなり、小形化を図ることができる。

【0035】また、この発明に係る自動車電話用ガラスアンテナ装置は、扇形状、二等辺三角形形状、多角形状それぞれを、それ自身の相似形で中を抜いた外側のパターンで、放射用パターンを形成し、1つの自動車電話用ガラスアンテナ装置で、800MHzと1.5GHzの周波数帯域の電波を良好に受信することができるので、アンテナの実装スペース効率が良くなり、小形化を図ることができる。

【0036】また、この発明に係る自動車電話用ガラスアンテナ装置は、放射用パターンの給電点と、接地用パターンの接地点近傍に導体パターンで形成したインピーダンス調整手段を備え、給電点と接地点に接続された同軸ケーブルと整合するので、周波数帯域全体に亘り高感度を実現することができる。

【0037】よって、800MHzと1.5GHzの2つの周波数帯域の電波を良好に受信する小形で高感度の自動車電話用ガラスアンテナ装置を提供することができる。

【図面の簡単な説明】

【図1】この発明に係る自動車電話用ガラスアンテナ装置の構成図

【図2】この発明に係る自動車電話用ガラスアンテナ装置の指向特性図

【図3】この発明に係る自動車電話用ガラスアンテナ装

置の 800 MHz 帯域における感度周波数特性図

【図 4】この発明に係る自動車電話用ガラスアンテナ装置の 1.5 GHz 帯域における感度周波数特性図

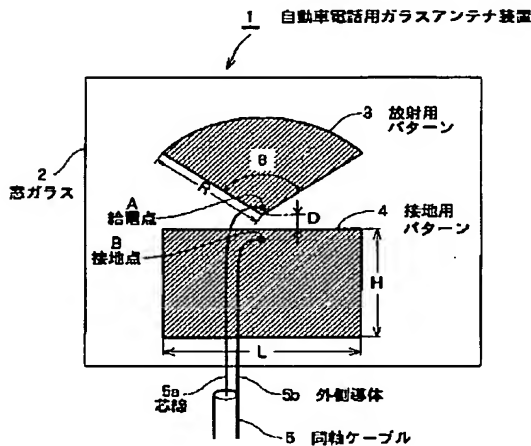
【図 5】この発明に係る自動車電話用ガラスアンテナ装置の 800 MHz 帯域における電圧定在波比周波数特性図

【図 6】この発明に係る自動車電話用ガラスアンテナ装置の 1.5 GHz 帯域における電圧定在波比周波数特性図

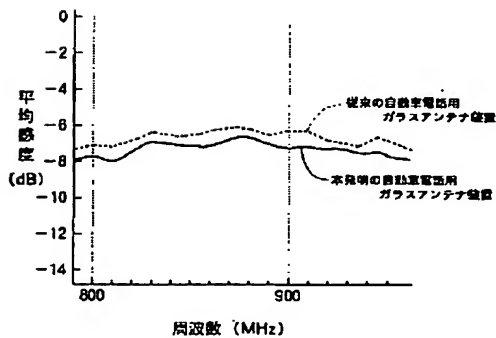
【図 7】この発明に係る自動車電話用ガラスアンテナ装置の別実施例構成図

【図 8】この発明に係る自動車電話用ガラスアンテナ装 \*

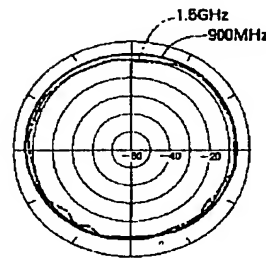
【図 1】



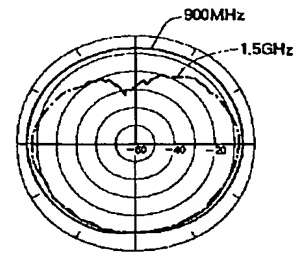
【図 3】



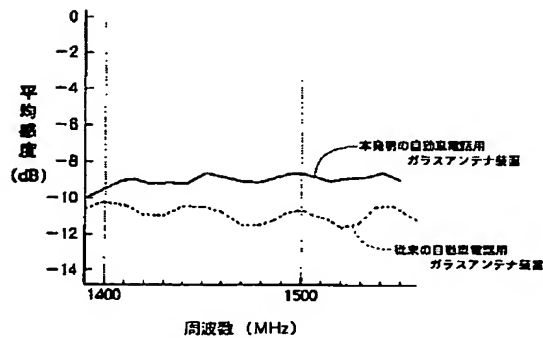
【図 2】



【図 10】

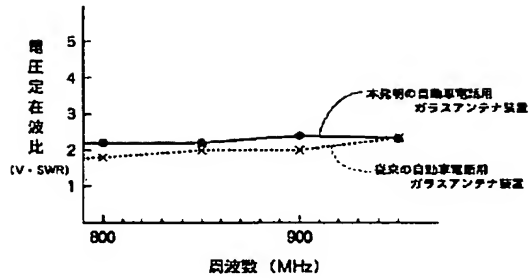


【図 4】

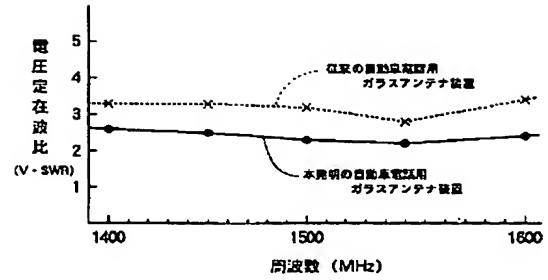




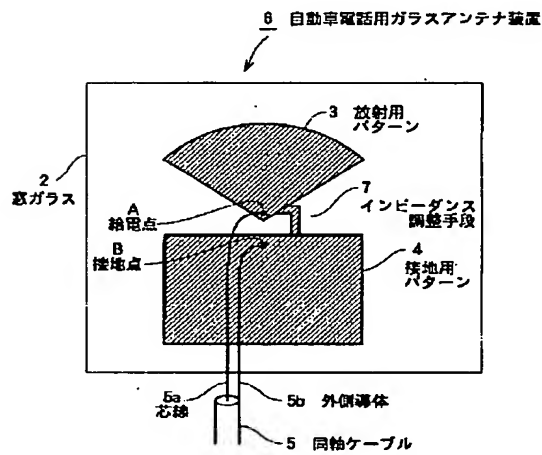
【図5】



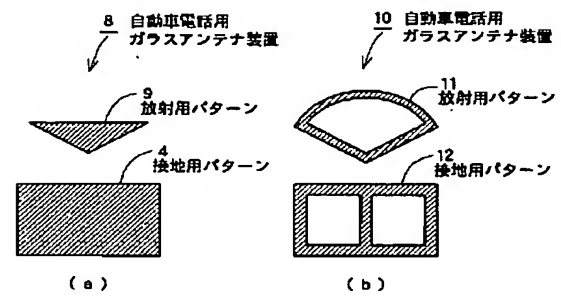
【図6】



【図7】



【図8】



【図9】

